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International Society for the History and Bibliography of Herpetology

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The Society

The **ISHBH** is a not-for-profit organization established to bring together individuals for whom the history and bibliography of herpetology is appealing, to promote the knowledge of related topics among members and the general public, and to promote research. Membership is open to anyone who shares the aims of the Society.

Membership

The biennial fees for 2010–2011 (*Bibliotheca Herpetologica* vol. 9 and 10) are as follows: Benefactor US$100, Sponsoring US$50, and Regular US$30. Lifetime membership starting from 2010 (vol. 9) is US$300. Institutions pay minimum US$50. The fee includes a subscription of two volumes to the Society's journal *Bibliotheca Herpetologica*. A membership application form that includes the possibility to order back issues can be found on our website. Payment can be made by personal check or money order in USD drawn on a US bank sent to the Secretary-Treasurer or the Chairperson. Payment can also be made by transfer in euro to PlusGirot, Sweden, IBAN SE83 9500 0099 6042 0455 1206, BIC NDEASESS. Payment by credit card can be made on the website ZenScientist, www.zenscientist.com, with an additional cost of 10 %. This website is run by Breck Bartholomew, Utah, USA. It can be used also for applying membership to many other national and international herpetological societies. ZenScientist.com is designed to promote communication and collaboration within the herpetological community. Try it!

Members are encouraged to contribute with articles, essays, news of meetings, hints on antiquarian trade, book reviews and other issues associated with herpetology. The Society organizes seminars, visits to libraries, museums, etc. in connection with herpetological meetings with international participation. The Society works to facilitate informal contacts among members so that the members can meet, offer support in knowledge and transact exchanges of literature.

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Instructions for Authors

Authors submitting a manuscript do so on the understanding that the work has not been published before and is not being considered for publication elsewhere. Manuscripts are peer reviewed.

The language of *Bibliotheca Herpetologica* is English. Consult the latest issue of *Bibliotheca Herpetologica* for article format. The Editor reserves the right to adjust style to maintain uniformity.

Manuscripts and illustrations should be submitted to the Editor in electronic form. Color illustrations other than used for the cover will be at the author's expense.

www.t-ad.net/ishbh

Society News

The Society Meeting 2009

The ISHBH 2009 annual meeting was held in Portland, Oregon, USA, on July 27, 2009 at Jake's Grill, Portland, Oregon, in conjunction with the Joint Meeting of Ichthyologists and Herpetologists on 22 to 27 July. The meeting took place at lunchtime and was attended by nine members, including three from the Board, and two guests. The Treasurer's report for 2008 was presented. At the close of 2008 there were 124 members and the Income was $1,014 with a net profit of $10. The Treasurer's report was approved by all members in attendance and the members unanimously approved the granting of freedom of responsibility for the Board members. The Financial Statement can be seen on the website or requested from the Treasurer.

A Darwin Symposium

The meeting coincided with the one day Symposium *Darwin at 2009: A View from Ichthyology and Herpetology*, that was organized by Dr. Tim M. Berra. Dr. Berra is Professor Emeritus of Evolution, Ecology and Organismal Biology at the Ohio State University. Although several of the talks were on general Darwinian topics, all of great relevance to the audience, a few treated Charles Darwin FRS (1809-1882) with a bona fide historical and herpetological connotation. Dr. Berra opened the symposium with a talk on Darwin, portraying him as an influential scientist. Darwin's theory of evolution ranks as one of the most powerful ideas in science and may well be the greatest idea ever had by a human mind. Among other Darwin accomplishments were the drafting of the first evolutionary tree hypothesizing the relatedness of all animal life (1837). Darwin explained how coral reefs form (1842) and contributed to geological observations on earth movements (1844) and the deformation theory of metamorphic rock (1846). He described all known barnacle species, fossil and living (1851-1854), explained how orchids are fertilized by insects (1862), and how plants climb (1865). He introduced the "control" in "controlled experiment" and he catalogued the variation in domestic plants and animals (1868). He explained human origins and sexual selection in ways never before articulated (1870-71), and discussed human and animal emotions (1872). The latter work was one of the first books to use photographs. Darwin showed how insectivorous plants growing on impoverished soils utilize nitrogen-rich insects (1875), and he demonstrated that the offspring of cross-fertilized plants were more numerous and vigorous than self-fertilized ones (1876, 1877). His observations of climbing plants laid the foundation for the field of plant growth hormones (1880), and his work on earthworms (1881) is a classic study in ecology.

Aaron Bauer, in collaboration with Colin McCarthy, provided a detailed report on the fate of the 270 specimens of reptiles and amphibians that Darwin and the officers of the *Beagle* collected and deposited in England. Thomas Bell (1792-1880) examined some of the frogs and lizards and authored the herpetological portions of the Zoology of the Beagle. The snakes were sent to Paris for identification by Gabriel Bibron (1806-1848). Another ten *Beagle* specimens, presented by Bell, are present in the Muséum national d'Histoire naturelle in Paris. The location and disposition of the remaining ~130 specimens, including the snakes sent to Bibron, remain unknown.

David Wake gave a talk entitled "Darwin's species" pointing at the fact that Darwin did not focus on the species concept in his 1859-book "On the Origin..." but centered his attention on variation, natural selection and adaption. The sole figure in the book is a depiction not of phylogeny, as often stated, but of species formation, showing how phenotypes become distinct from the combined effects of adaptive

divergence and extinction. The Californian *Ensatina* salamanders form a ring-species complex that is an appropriate representation of Darwinian species formation. Gradual adaptive divergence is taking place from a northern stock in two geographic directions, leading ultimately to different end-points that overlap in the south, where two distinct forms are sympatric at one site with no genetic interchange.

David Smith and co-author Inci Bowman explored Darwin's critics and the contemporary arguments that Darwin faced during his lifetime. Today's antievolutionists come almost exclusively from the fundamentalist religious community, but in the mid-nineteenth century, the opposition was much broader and more respectable. Among his critics, although their arguments were quite different, were two prominent figures in ichthyology and herpetology: Louis Agassiz and Edward Drinker Cope. Smith and Bowman assessed the opposition to Darwin's theory within the context of the time, presenting the world as his critics saw and understood it, and not judging them by what we know today.

Sekretär

Sekretär is the journal published by our German sister organization *Beiträge zur Literatur und Geschichte der Herpetologie und Terrarienkunde*, a working group of the German society *Deutsche Gesellschaft für Herpetologie und Terrarienkunde* (DGHT). In the second issue of 2008, volume 8 (2), there was a praising presentation of ISHBH and the contents of this journal. The same issue also contains a long article written by Josef F. Schmidtler on Nikolaus Michael Oppel (1782-1820) as a genius German reptile painter and herpetologist. Several remarkable water paintings are reproduced in color. The next article by Tamás Tóth, Wolfgang Böhme and Torsten K. D. Himmel is a biography of the Hungarian herpetologist Baron Géza Gyula Imre Fejérváry being a 75-year commemoration on the year of his death. The portrayal includes his described taxa, the taxa that are named after him, and a list of his published writings in herpetology, the latter including 61 items. The first issue of 2009, volume 9 (1), contains a portrayal of the German explorer and herpetologist Heini Hediger (1908-1992) authored by René E. Honegger. This is followed by a similar paper presenting the life of Bruno Dürigen (1853-1930), also a German, who was very broad in his interest and publishing efforts of natural sciences, including herpetology, ichthyology, and poultry. Volume 9 (2) commemorates August Johann Rösel von Rosenhof (1705-1759) on the 250th year of his death. There are six papers relating to Rösel and his amazing and masterly illustrated book from 1758 *Historia naturalis ranarum nostratium* that deals with the anuran biology. All papers in *Sekretär* are in German with short summaries in English. For membership or subscription, please consult their website www.lght.de.

Membership

The numbers produced of the journal of the Society, *Bibliotheca Herpetologica*, have unfortunately not kept pace with the biennial membership periods. However, members should be assured that any paid membership fee is tied to the number of issues received, i.e. any two-year period has or will be extended automatically to contain two volumes, presently four issues, of the journal. Right now, most regular members have enrolled for a period of two years starting from 2007, which therefore also includes membership for 2009. The future in respect of the journal publication looks more promising, as the Editor now has papers available for forthcoming issues including the Proceedings of the Linnaean symposium 2007. A few members have signed up and paid starting from volume 8 of the journal. Except for these and Life time members it is now time to renew for 2010 and 2011 and *Bibliotheca Herpetologica* vols. 9 and 10. Please refer to the inside cover for payment instructions. All current members will be advised by e-mail or letter of their membership status.

Richard Wahlgren

About the cover

Pipa pipa from an original watercolor by Maria Sibylla Merian

Richard Wahlgren
Prennegatan 23B,SE-22353 Lund, Sweden,

The frogs on the cover plate represent a female with young of the Surinam toad, *Pipa pipa*. The original illustration by Maria Sibylla Merian (1647–1717) was prepared as a pen and ink drawing with watercolor and bodycolor on vellum. The image is the basis of Plate 59 in her book (1705) *Metamorphosis insectorum surinamensium*. The author published the book herself in Amsterdam. It contains 60 plates, each accompanied with a text page, most of which focus on insects, but other animals such as frogs, a lizard and a snake were included. The original paintings are now in the collection of the British Museum, London, and the photograph on the cover is copyrighted by The Trustees of the British Museum. Merian's masterpiece set a new standard for natural history books and it was an extraordinary undertaking of the time for her and one of her daughters to travel to South America to study the tropical flora and fauna of Surinam. In an article in this issue Kay Etheridge portrays Maria Sibylla Merian, her paintings, and the frogs she depicted for the book. The cover forms figure 3 in the article.

Linnaeus described the Surinam toad in *Systema naturae X*, the 10th edition of 1758 and named it *Rana pipa*. His description in translation reads, "Frog with stubby, four toothed front feet, clawed rear feet. Lives in Surinam. It hatches its young by laying them on its back." [Kenneth Jr Kitchell, and Harold A. Dundee. 1994. *A Trilogy on the Herpetology of Linnaeus's Systema Naturae X*]. Linnaeus actually described it for the first time in 1754, when he catalogued the collection of King Adolf Fredrik of Sweden. This collection subsequently went to the Swedish Museum of Natural History in Stockholm, where a few specimens of *Pipa pipa* still occur, but one cannot positively attribute all or any one in particular as Linnaean type specimens. In 1745 Linnaeus, then Professor at Uppsala University, received and subsequently catalogued a donation of animals from then Crown Prince Adolf Fredrik, but he did not include all specimens and apparently left out the Surinam toad. Carl Peter Thunberg, who eventually took Linnaeus's post, found a Surinam toad in the collection and listed it in part I of his catalogue of various natural history collections in 1787. This specimen is extant (Lars Wallin. 2001. Catalogue of type specimens. 4. Linnaean specimens). [*www.evolutionsmuseet.uu.se/samling/UUZM04_Linnaeus.pdf*]. It ought to be treated as a syntype.

In 2009 the Cologne-based publisher Taschen released a 192-page multilingual book entitled *Sibylla Merian, Insects of Surinam* authored by Katharina Schmidt-Loske. She has an academic background as a herpetologist and in 2008 she was appointed director of the Biohistoricum at the Museum Koenig, Bonn, Germany. The book includes reproductions of Merian's plates in the 1705-work (ISBN: 978-3-8228-5278-1). It is advertized as a reprint but it is not obvious if the 2009-plates are faithfully reproduced, as the size of the original plates are not stated. The original text has been replaced by commentaries. A second edition copy from 1719 with 72 plates was sold at an auction in Sweden on March 25, 2010 with a price including commission of $124,000.

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Jean-Emmanuel Gilibert and a Lost Chapter in the History of Chelonian Anatomy

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Abstract. *Jean-Emmanuel Gilibert (1741–1814) was a well known French physician, botanist, and champion of the Linnaean system. Between 1775 and 1783 he taught and carried out research in Lithuania (then also including part of the modern Belarus) at the invitation of Stanisław August Poniatowski, King of Poland. During this period he made observations on the anatomy of the European pond turtle (*Emys orbicularis*) and subsequently published three accounts (1781, 1782, 1800) of his findings, including a description of genital anatomy, in books chiefly devoted to the flora and fauna of Lithuania. Gilibert illustrated one of these works,* Exercitium Botanicum*, with two much older plates depicting sea turtle anatomy. These had originally been prepared by Pierre Richer de Belleval (1558–1623) and had been purchased by Gilibert, along with many botanical plates, for instructional use in Lithuanian universities. Gilibert's contributions to chelonian anatomy have been almost entirely forgotten, in part because they were published in Lithuania in works known chiefly for their botanical content, and in part because they were eclipsed four decades later by the classic* Anatome Testudinis Europaeae *by Ludwig Heinrich Bojanus. Like many early works in herpetology, Gilibert's contributions, which were novel for his time, have become "lost" to modern scholars. Annotated citations to Gilibert's scientific publications reveal the scope of his interests and clarify bibliographic confusions associated with many of his books.*

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Gilibert's Life and Work

Jean-Emmanuel Gilibert (1741–1814; Fig. 1) was an important French naturalist of the late 18th and early 19th centuries. He is known primarily through his work in botany and medicine but, as a true scholar of the Age of Enlightenment, he was also interested in other fields of science, among them zoology, mineralogy, and geography. After studying (1760–1763) in Montpellier, Gilibert practiced medicine in and around Lyon and published on medical subjects (Gilibert 1772, 1776). At the same time, he conducted botanical research. He established friendships and corresponded with various naturalists, among them Antoine Gouan (1733–1821) and Albrecht von Haller (1758–1823). Gilibert was one of several naturalists from Montpellier known for their popularization of the Linnaean nomenclatural system in France (Gilibert 1770), and later in life he edited and augmented French versions of several of Linnaeus's works (Gilibert 1785–1787, 1790). In 1773 he established the first botanical garden in Lyon (Gèrard 1896; Magnin 1906), but by 1775 he was in a difficult financial situation and was forced to seek employment abroad. Gilibert, recommended by Gouan and von Haller, accepted a proposal from Antoni Tyzenhaus (1733-1785) on behalf of Stanisław August Poniatowski (1732–1798), King of Poland, to come to the Grand Duchy of Lithuania (then part of the Rzeczpospolita Obojga Narodów or Polish-Lithuanian Commonwealth), to organize modern education in the fields of medicine and natural sciences as well as to increase knowledge of the country's natural resources. He spent eight years (1775–1783) in Lithuania, first in Grodno (now Hrodna, Belarus) where he established a botanical garden and medical school, serving as director and professor at the latter. From 1781 to 1783 he was Professor of Natural History at the Central School of the Grand Duchy of Lithuania in Vilnius (Fedorowicz 1958; Grigelis 2007).

Gilibert hurriedly left Vilnius in 1783 due to illness and family problems as well as financial debts, and returned to France, leaving most of his natural history collections and papers behind. Eventually, in 1790, through protracted negotiations, he managed to retrieve the bulk of this material (Daszkiewicz 1999) but, following the closing of the University of Vilnius and other Polish universities in 1841, some of his collections were transferred to the Lyceum of Volhynia in Krzemieniec (near Kiev in modern Ukraine). This institution eventually gave rise to the St. Vladimir University in Kiev and some of Gilibert's herbarium is there today (Kohler 1994).

Back in Lyon, Gilibert became quite prominent, serving as both a doctor at the main hospital and professor at the College of Medicine and being elected to the Académie des Sciences and other learned societies (Chaumeton 1856). He continued with his medical and botanical work, publishing extensively on topics in both fields. Gilibert was a prominent proponent of medical vitalism and a supporter of Franz Anton Mesmer (1734–1815), the "discoverer" and popularizer of "animal magnetism" (Williams 2003) and published works on the subject (Gilibert 1784a, 1785). Another of his medical contributions reflected his work as Lyon's chief specialist in the control of epidemics (Gilibert 1784b), and one of his treatises (Gilibert 1791) was influential enough that it was promptly translated into German (Gilibert 1792b). Gilibert's botanical works drew in part from his own Lithuanian experiences, but he also compiled the works of others on European flora, and continued to promote the Linnaean system (Gilibert 1785–1787, 1787, 1790, 1791, 1792a, 1796).

During the French Revolution, Gilibert was active in politics, winning the office of mayor of Lyon in 1793, and serving as a leader of the Federalist Revolt in that city and subsequently as the first president of its Popular Commission (Rousset 1962; Hanson 2003). However, during The Terror, which began in September of that year, he went into hiding from the Jacobin authorities, and remained so for more than a year (Daszkiewicz 1999). Following the Revolution, Gilibert again returned to his scientific interests, publishing updated French language versions of his earlier Linnaean treatments in the form of practical botanical texts (Gilibert 1798, 1806), a flora of the Botanical Garden of Lyon (Gilibert 1809a), and a comparison of the floral calendars of Grodno and Lyon (Gilibert 1809b).

Fig. 1. *Bust of Jean-Emmanuel Gilibert sculpted by André le Brun (1737–1811), from 1767 official artist to King Stanisław August Poniatowski of Poland. From the National Museum in Warsaw. Image reproduced by permission from the archives of Edition Neriton, Warsaw.*

The biography and scientific work of Gilibert are relatively well known to historians of science. Two short monographs are devoted to the naturalist, and more particularly to his stay in what is now Belarus and Lithuania (Sławiński, 1925; Daszkiewicz, 1995). Among his accomplishments relevant to the development of botany in the region were the founding of botanical gardens and natural history collections, the organization of the teaching of

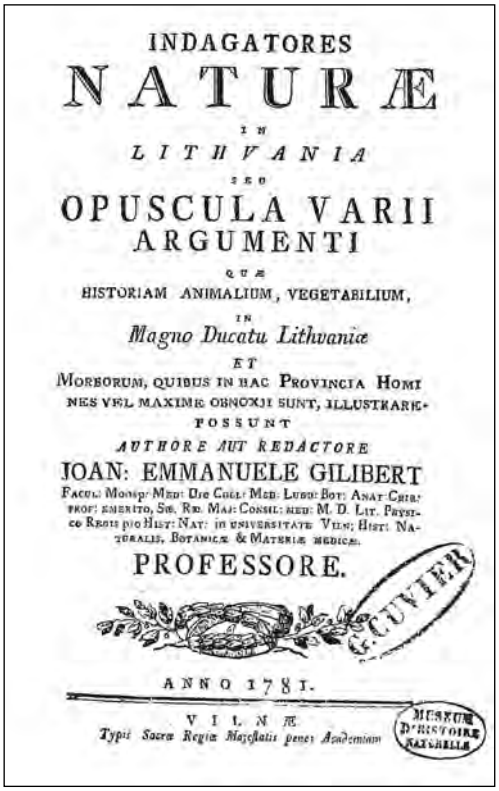

INDAGATORES
NATURÆ
IN
LITHVANIA
SEV
OPUSCULA VARII
ARGUMENTI
QVÆ
HISTORIAM ANIMALIUM, VEGETABILIUM,
IN
Magno Ducatu Lithuaniæ
ET
MORBORUM, QUIBUS IN HAC PROVINCIA HOMINES VEL MAXIME OBNOXII SUNT, ILLUSTRARE POSSUNT
AUTHORE AUT REDACTORE
JOAN: EMMANUELE GILIBERT
Facult: Monsp: Med: Dre Coll: Med: Lugd: Bot: Anat: Chir: prof: emerito, Sac. Reg. Maj: Consil: med: M. D. Lit. Præsidio Regis pio Hist: Nat: in universitate Viln: Hist: Naturalis, Botanicæ & Materiæ medicæ.
PROFESSORE.
G. CUVIER
ANNO 1781.
VILNÆ
Typis Sacræ Regiæ Majestatis penes Academiam
MUSEUM D'HISTOIRE NATURELLE

Fig. 2. *Title page of* Indagatores Naturae in Lithuania *(1781), in which Gilibert first published his observations on chelonian anatomy.*

the natural sciences, and the preparation of the first flora of Lithuania (Gilibert 1781–1783). He was probably also the author of one of the oldest phytogeographical maps (Daszkiewicz, 1999). Gilibert is regarded as one of the founders of the naturalists' school of Vilnius-Krzemieniec, at the time one of the largest research centres of natural sciences in this part of Europe (Gręb ecka, 1998).

Gilibert's works on chelonian anatomy

In comparison to his botanical contributions, the zoological works of Gilibert are less well known. Their importance has been stressed only recently (Daszkiewicz, 1995; Daszkiewicz et al. 2004, 2007). Gilibert taught animal anatomy at Grodno and Vilnius, made field observations, conducted breeding experiments, and prepared anatomical descriptions. He was principally interested in mammals and published on the wisent (*Bison bonasus*), elk (*Alces alces*), wolves (*Canis lupus*) and their hybrids with domestic dogs, bears (*Ursus arctos*), beavers (*Castor fiber*), wolverines (*Gulo gulo*), and hedgehogs (*Erinaceus europaeus*). His studies of the wisent included investigations of behavior and food preferences, as well as attempts at hybridization with domestic cattle. While in Vilnius, Gilibert began to prepare a book on comparative anatomy, the engravings for which were seen by Jean Bernoulli (1744–1807) during a visit to Lithuania (Kopaczewski, 1918). This work was never published and the manuscript has never been located (Daszkiewicz 1999), although long after his departure from Lithuania he edited a French edition of Linnaeus and Gmelin dealing with quadrupeds and cetaceans (Gilibert 1802, 1805) to which Gilibert himself contributed a comparative anatomical section, apparently using parts of the unpublished comparative anatomy text he had prepared decades earlier.

With respect to herpetology, Gilibert's contributions are limited to a mention of the eggs and embryos of the grass snake (*Natrix natrix*) in his discourse on beavers (in Gilibert 1800; snake eggs were located in the vaults of beaver lodges), and a more substantial anatomical work on the European pond turtle (*Emys orbicularis*). This contribution was published, with minor changes, in three different works by Gilibert. Gilibert (1781) first presented this work in a 15-page chapter, "Lucubratio Zoologica Anatomica de Testudine Lithuanica" [Zoological Anatomical Study of the Lithuanian Turtle], in a short book on various topics in botany and zoology, *Indagatores Naturae in Lithuania* [Explorations of Nature in Lithuania] (Fig. 2). This work, in Latin, describes the external appearance, osteology, and internal anatomy of the pond turtle, with the greatest detail on the last subject. This more general section is followed by a relatively detailed discourse on chelonian genital morphology. Finally Gilibert discusses

other specimens in his collection and considers the identity of his study species, noting that it is similar to *Testudo orbicularis* [= *Emys orbicularis*], but differs in having distinct digits connected by short webs rather than palmate feet as described by Linnaeus. He also made comparisons with turtles described by Aldrovandi (1637 or 1645; Gilibert specifically referenced page 706 in Aldrovandi's work, but the contents of this page are identical in both these editions of this work) and Rzączyński (1736 or later editions; see Daszkiewicz and Heurtel 2006), concluding that his Lithuanian turtle was identical with Aldrovandi's *Testudo nemoralis* and the turtle described from Poland by Rzączyński.

In fact, by Gilibert's time a number of anatomical works had been published on chelonians. Among the many works with anatomical descriptions of turtles, including many dealing with cheloniids and testudinids, but also some discussing *Emys orbicularis*, are Malpighi (1671), Blasius (1676, 1681), Perrault (1676, 1733), Redi (1684), Caldesi (1687), Mery (1703a, 1703b, 1703c), Bussiere (1710), Besler and Besler (1716), Du Verney (1718), Valentini (1720), and Feuillée (1725a, 1725b, 1725c, 1725d) (Schaffer 2008; see also Rhodin 2008 for a list of pre-Linnaean chelonian publications).

Gilibert (1782) included the chapter, "Observatio IV. De Testitudine Lithuanica" in another short book on natural history, *Exercitium Botanicum* (Fig. 3), the following year. This repeats the earlier Latin text nearly verbatim, with only some minor corrections and orthographic changes. Two of the three plates accompanying this work depict marine turtle anatomy. The first (Fig. 4) shows an animal in ventral view with its plastron removed and selected organs exhibited in a very stylized way. The second shows details of the esophagus, with its conical papillae (Fig. 5). Since Gilibert did not have access to marine turtle material, it must be assumed that he chose to illustrate some of the features he discussed in *Emys* using previously

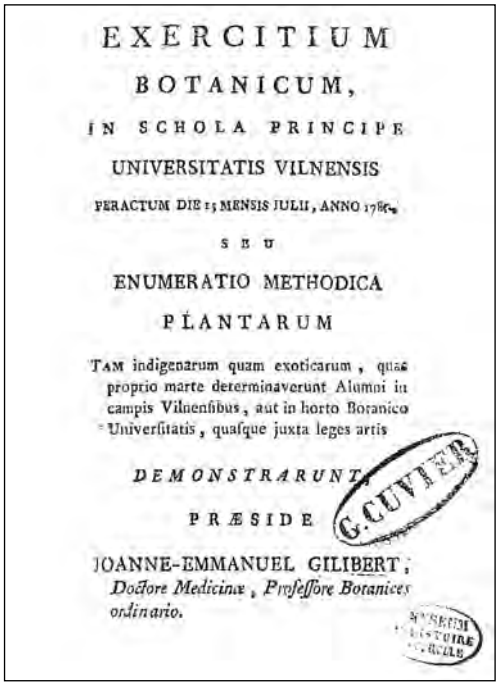

EXERCITIUM
BOTANICUM,
IN SCHOLA PRINCIPE
UNIVERSITATIS VILNENSIS
PERACTUM DIE 15 MENSIS JULII, ANNO 178[illegible]
S E U
ENUMERATIO METHODICA
PLANTARUM
Tam indigenarum quam exoticarum, quas proprio marte determinaverunt Alumni in campis Vilnenſibus, aut in horto Botanico Univerſitatis, quaſque juxta leges artis
DEMONSTRARUNT
PRÆSIDE
JOANNE-EMMANUEL GILIBERT,
Doctore Medicinæ, Profeſſore Botanices ordinario.

Fig. 3. *Title page of* Exercitium Botanicum *(1782), Gilibert's second work in Latin dealing with chelonian anatomy.*

prepared figures. This hypothesis is supported by the fact that in Gilibert's other works of natural history, he invariably used relevant older illustrations rather than having new ones prepared (Daszkiewicz et al. 2004). The source of Gilibert's marine turtle figures is not given on the plates themselves and the figures are reasonably crude in their rendering. As most anatomical illustrations in books of the late 18th century are more naturalistic and exhibit much greater attention to detail, this suggests that they are derived from a considerably earlier work.

Immediately prior to Gilibert's publications, Christoph Gottwaldt's (1636–1700) *Physikalisch-anatomische Bemerkungen über die Schildkröten* [Physical and Anatomical Comments Regarding Turtles] (1781) appeared. This posthumous work presented information from the chelonian portion of Gottwaldt's more extensive natural history collections, which had been purchased by Peter the Great

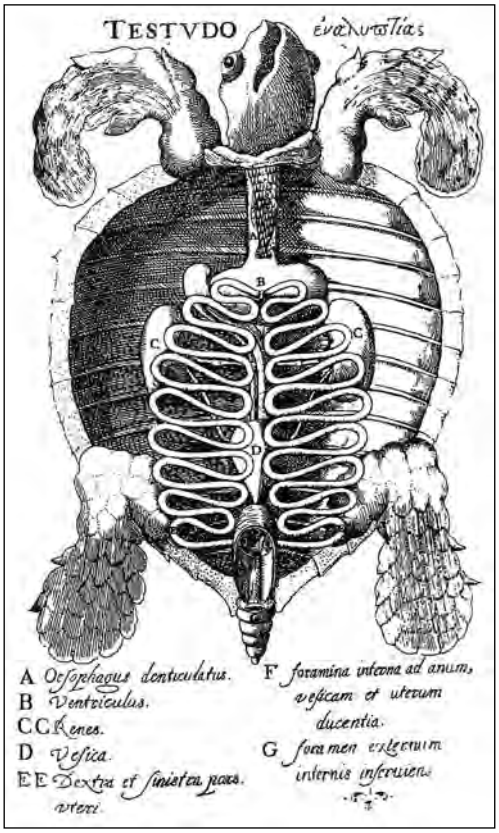


Fig. 4. *Plate from Gilibert's* Exercitium Botanicum *illustrating a dissected* Caretta caretta. *The style is crude for the time as the plate was copied from an original prepared by Pierre Richer de Belleval more than 150 years earlier. Note: left hand caption electronically retouched.*

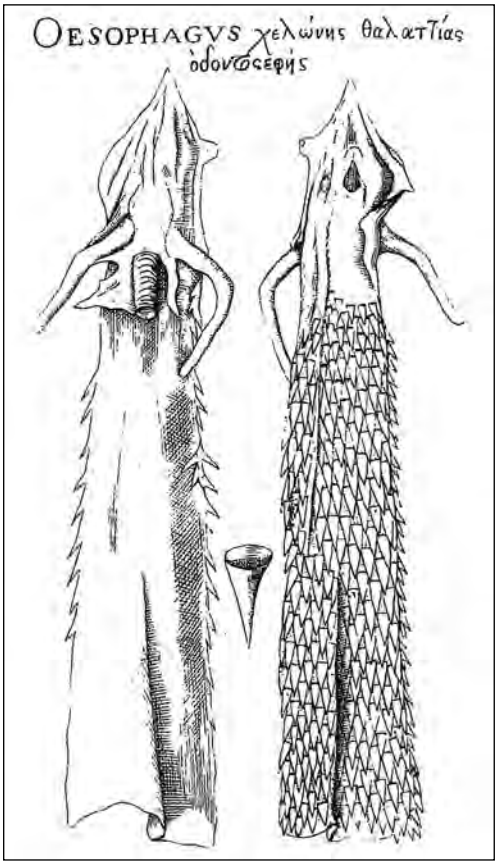


Fig. 5. *Plate from Gilibert's* Exercitium Botanicum *illustrating the esophagus of* Caretta caretta *with the papillose inner surface shown on the right side of the figure.*

of Russia. The plates had been prepared long before and appeared in a handwritten atlas of Gottwaldt's museum in Gdansk, dated 1714 and known from only three copies (Yuriev 1976). Gottwaldt (1714, 1781) included a turtle dissection (Fig. 6) posed similarly to that of Gilibert, but the quality of the illustration is much higher and the anatomy depicted more realistic. In style Gilibert's images resemble somewhat the illustrations of Caldesi (1687). However, this work includes no images comparable in view to those of Gilibert. Further, the oviducts, which are realistic in proportion in Caldesi's plate 6 (Fig. 7) are extremely narrow, elongate, and convoluted in Gilibert's plate of the whole turtle.

The key to the origin of the plates is found in Gilibert's (1782:91) comment "Oesophagus similis intestinis ... sicut egregie expressit Belleval in tabula secunda" [Esophagus similar to intestine ... as well illustrated by Belleval in the second plate]. Pierre Richer de Belleval (1558–1623) was a physician and founder of Montpellier's botanical garden and is considered the "father of French botany." He prepared more than 500 botanical copper plates for a major work on the flora of Languedoc, which was never published. Before his departure for Lithuania, King Stanisław of Poland gave Gilibert money to purchase the herbarium of Antoine Gouan (1733–1821) and a variety of natural history plates (500

in all) for use in Grodno and Vilnius. Among the materials purchased were some 185 of Belleval's original plates, although, based on drawings and/or prints conserved in Montpellier, Gilibert could and may have had new plates made from Belleval's designs (Amoreux 1786; Dorthes 1788). Gilibert took the plates with him to Lithuania and when he returned to France Stanisław allowed him to keep them as a gift. Gilibert and Gouan intended to publish the plates in sets of ten plates at a time (Amoreux 1786; Dorthes 1788), but the advent of the French Revolution put an end to this plan. Nonetheless, Gilibert (1796) subsequently used 282 of these plates in the 4th edition of *Démonstrations Élémentaires de Botanique*. In addition to the botanical plates, at least some of those purchased by Gilibert were of animal anatomy. Indeed, two of these plates were fortuitously mentioned by Dorthes (1788:48–49) who wrote that "Parmi ces figures on en trouve deux qui servent à décrire une tortue marine, que j'ai lieu croire celle qu'a décrite LINNE sous le nom de *testudo caretta* qu'on a pêchée plusieurs fois sur nos côtes, quoiqu'elle appartienne davantage aux mers d'Amérique. Une planche représente cette tortue ouverte, pour en laisser voir l'anatomie intérieure, dont les parties sont expliquées au bas de la figure; l'autre planche représente, l'œsophage de cette tortue, armée à l'intérieur de papilles coniques cartilagineuses, & placées en recouvrement; BELLEVAL a été le premier à observer ce singulier caractère." [Among these figures one finds two which are used to describe a marine turtle, that I have cause to believe was described by Linnaeus under the name *Testudo caretta*, which has been caught several times on our coasts, though it belongs more to the seas of America. One plate represents this turtle opened to allow the internal anatomy to be seen, of which the parts are explained at bottom of the figure; the other plate represents the esophagus of this turtle, armed inside with cartilaginous overlapping conical papillae; Belleval was the first to observe this singular character.] That Belleval's

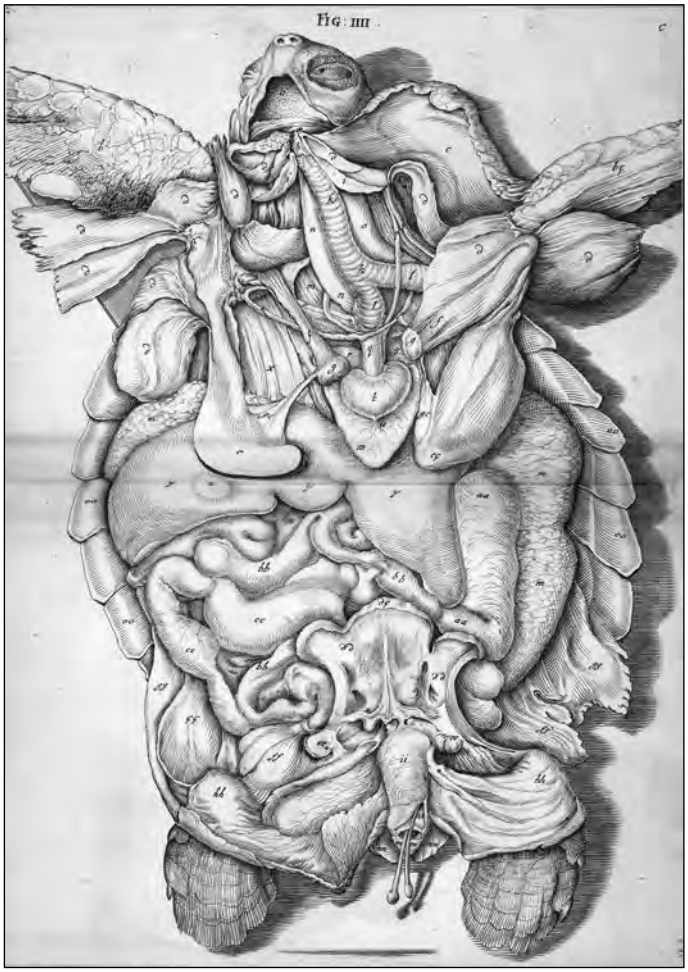


Fig. 6. *Plate from Gottwaldt (1714) illustrating sea turtle anatomy. Note the accuracy and detail of the image relative to that of the similarly posed plate of Gilibert/Belleval (Fig. 4). The same plate appeared in Gottwaldt's (1781) work on turtles. Image courtesy of Le Service de la Documentation de l'Université de Strasbourg.*

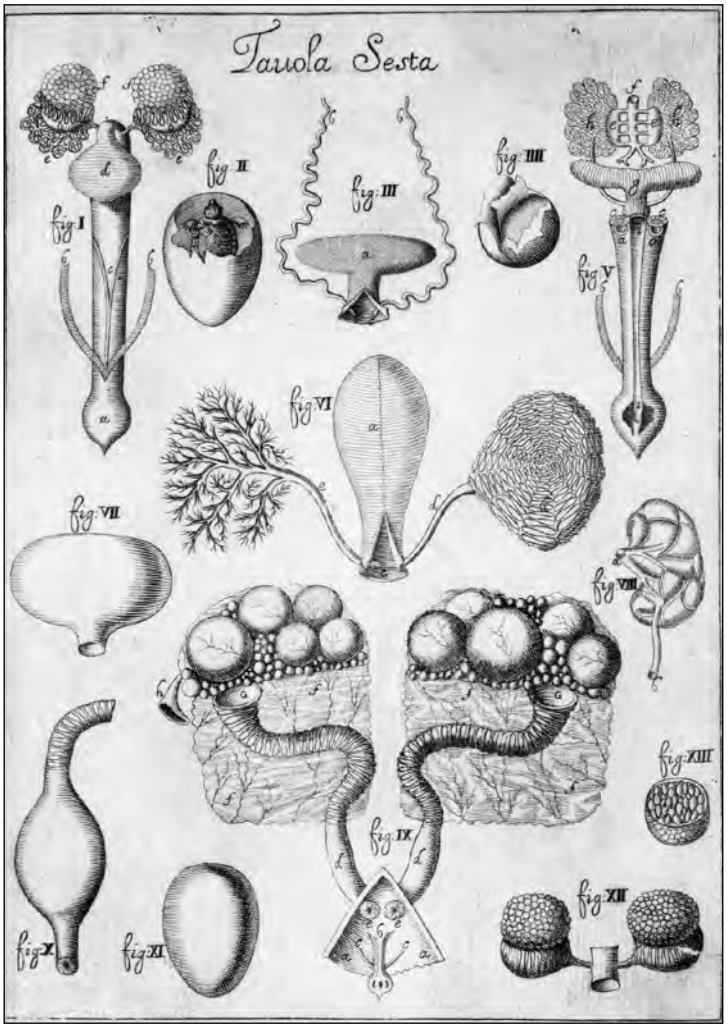


Fig. 7. *Plate 6 from Caldesi's (1687) work on turtle anatomy. Although similar in style to Gilibert's plate (Fig. 4), the anatomical details are far more accurate (compare oviducts in both illustrations). Image courtesy Biodiversity Heritage Library (http://www.biodiversitylibrary.org).*

Caretta caretta plates were the source of Gilibert's (1782) illustrations is further evidenced by the inclusion of a Greek caption on each plate; Belleval had proposed an original nomenclatural system in which all plants were named using a Greek word that expressed their essential character.

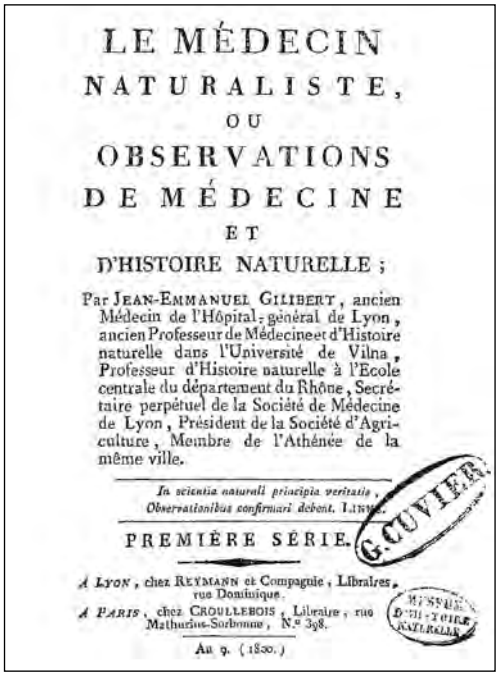
The first two of Gilibert's books with chelonian content were published in Vilnius. The third contribution, *Le Médecin Naturaliste* (Gilibert 1800; Fig. 8), published in France, long after his return to his homeland, included a short section (pp. 290–293) on "Observations sur les parties génitales des Tortues" [Observations on the genital parts of turtles]. In this piece he explains that on 7 July 1776 (thus while in Grodno) he dissected several "tortues terrestres très-communes en Lithuanie" and noted the singular structure of the male genitals, information that he sent to Haller, who confirmed the novelty of the findings. He subsequently had the opportunity to dissect a female and in the paper he describes the genital structure of both sexes as well as the act of copulation. He provided the greatest detail on the musculature and corpus cavernosum of the turtle penis and on this basis hypothesized about the mechanism of erection. A German translation of *Le Médecin Naturaliste* (not seen by us) was published some years later (Gilibert 1807).

The fate of Gilibert's herpetological contributions

The first publications by Gilibert on the European pond turtle predate the monumental work of turtle anatomy by Ludwig Heinrich Bojanus (1776–1827) by four decades. Interestingly, Bojanus's work (1819–1821) was carried out at the very institution where Gilibert had worked in Vilnius. Fedorowicz (1958) in his

biography of Bojanus noted that Gilibert was the progenitor of vertebrate morphological study in Poland (as then construed), but that he trained no students or successors in this field. Based on Bojanus's own writings and the apparent limited lasting impact Gilibert had on zoology, it seems unlikely that Bojanus was aware of his predecessor's chelonian work. Indeed, despite his relatively detailed descriptions, particularly of genital anatomy, Gilibert's work has gone largely unnoticed by subsequent workers. Bojanus (1819–1821) did not mention it and most subsequent workers appear to have taken Bojanus as their starting point, ignoring earlier works. However, even those that did cite earlier works appear to have missed Gilibert. His contributions are not cited by Walbaum (1782) or by Schneider (1783), who provided an amazingly detailed summary of earlier chelonian works, including those dealing with anatomy. Neither are Gilibert's publications cited in works specifically dealing with urogenital morphology (Duvernoy 1848; Anderson 1876; van Wijhe 1880; Gadow 1887; Hoffmann 1888; von Möller 1899; Schmidtgen 1907). Even quite early works on the subject (e.g., Geoffroy St.-Hilaire and Martin 1828a, 1828b) do not mention Gilibert. Likewise, the major chelonian anatomical treatise of the 20th century (Thomson 1932) fails to cite him, limiting literature references to works since Bojanus (1819–1821). Indeed, we have been unable to locate any citations of the three Gilibert books in which turtle anatomy is mentioned in any chelonian literature. Gilibert's works containing herpetological sections seem to be relatively uncommon in libraries. The WorldCat database of institutional holdings indicates five copies of the 1781 work, two of that from 1782, and seven of the 1800 work (as well as two copies of its German translation) in European and American collections.

The fate of the herpetological work of Gilibert in Lithuania in the late 18th century is somewhat similar to that of Antoni Andrzejowski in Ukraine in the early 19th century (Daszkiewicz and Bauer 2008). Both authors published


LE MÉDECIN
NATURALISTE,
OU
OBSERVATIONS
DE MÉDECINE
ET
D'HISTOIRE NATURELLE;

Par JEAN-EMMANUEL GILIBERT, ancien Médecin de l'Hôpital-général de Lyon, ancien Professeur de Médecine et d'Histoire naturelle dans l'Université de Vilna, Professeur d'Histoire naturelle à l'Ecole centrale du département du Rhône, Secrétaire perpétuel de la Société de Médecine de Lyon, Président de la Société d'Agriculture, Membre de l'Athénée de la même ville.

In scientia naturali principia veritatis, Observationibus confirmari debent. LINN.

PREMIÈRE SÉRIE.

A LYON, chez REYMANN et Compagnie, Libraires, rue Dominique.

A PARIS, chez CROULLEBOIS, Libraire, rue Mathurine-Sorbonne, N.° 398.

An 9. (1800.)

G. CUVIER.

Fig. 8. *Title page of* Le Médecin Naturaliste *(1800), Gilibert's final, and only French language, book including a section on chelonian anatomy.*

original research in books that were chiefly botanical, including several published in Lithuania. Their works were probably overlooked by herpetologists, even in their own times, both because they were "buried" in works on other subjects, and because of the limited distribution of such Lithuanian imprints in the intellectual centers of western Europe. In the case of Gilibert, his, and most other earlier chelonian anatomical contributions, were eclipsed by the work of Bojanus (1819–1821) and were rarely, if ever, cited again. Although both taxonomic and anatomical works tend to retain their utility longer than those in other zoological fields, there is an ever-increasing trend for researchers to limit their forays into the older literature to those references that can be located by familiar online searches. As a consequence, contributions such as Gilibert's anatomy of *Emys orbicularis* have become part of a growing body of "lost" herpetological heritage.

Acknowledgements

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Maria Sibylla Merian's Frogs

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Maria Sibylla Merian (German, 1647–1717) is best known for her magnificent 1705 publication, *Metamorphosis insectorum surinamensium*, although she published earlier works on insect metamorphosis. Merian wrote the text and painted all of the illustrations for her books, and for the early volumes she produced most of the engravings. Contemporary scholarship has focused primarily on Merian's detailed images of lepidopteran and host plant life cycles, but Merian's Surinam album also portrays anuran metamorphosis, including the first European depiction of *Pipa pipa*.

Merian was born into a family of well-known artists and engravers, and there is ample evidence that she was drawing and painting at an early age. Even as she honed her painting skills she began her observations of live insects. Merian recorded in her study journal that she raised silkworms and other insects by the age of 13, and she continued similar studies throughout her life (Merian, 1976).[1] She did not limit her interest in metamorphosis to insects however, and her journal has an entry recorded from Frisia, Germany in 1686 in which she recounted collecting frogs for study: "I cut open the female and found there a 'matrix' like all the other animals have (thus they do not expel them through the mouth as some writers have claimed)..." (Merian, 1976, journal entry 203). In this same entry she wrote that she collected "frog lay" from water and observed it until

> … after several days, the little black dots began to show signs of life and were actually feeding on the white slime that surrounded them. Following that, they acquired little tails and swam in the water like fish. By mid–May they had eyes, and eight days later two little hind legs sprouted, and in another eight days two front legs. Now they looked like little crocodiles. Later the tail withered and they were proper frogs hopping out onto the land.

As was her habit, this text was accompanied by images of the animals meticulously painted on vellum. Merian also included images of two different adult frogs in her study journal. She typically used the images of insects and other animals recorded in the journal as models for the engravings in her subsequent natural history books, and as source images for watercolors produced for collectors (Figure 1 is an example of the latter).

At thirty-two Merian published her first "Raupen" or caterpillar volume. *Der Raupen wunderbare Verwandelung und sonderbare Blumen–Nahrung* contains fifty plates and associated text on European moths and butterflies and their larval host plants (Merian, 1679). The second *Raupen* volume of the same title and format was published four years later (Merian, 1683). After moving from Germany to Amsterdam in 1691 Merian was inspired by exotic specimens from the Americas that she observed in the possession of missionaries, merchants, and other collectors. In 1699 she traveled to Dutch Surinam specifically to study organisms of the tropics, and was the first European naturalist to do so independently. Once there, she worked for 21 months collecting, observing, and painting over 60 plant species and 90 animal species; the latter were primarily insects, although she included

[1] *Merian's study journal was published in a limited edition facsimile volume with commentary (Merian, 1976), which documents decades of natural history study. The original journal is in St. Petersburg at the Russian Academy of Sciences. Czar Peter the Great worked in Amsterdam when he was a young man, and, impressed by Merian's work, collected dozens of her original watercolors as well as the journal.*

Fig. 1. *Frog metamorphosis as depicted by Merian. Pen and ink with watercolor and bodycolor on vellum, 23 by 32 cm. This undated image from the British Museum prints and drawings collection was copied by Merian from entries made in her study journal in 1686. The frogs and tadpoles are most likely* Rana lessonae*,* Rana ridibunda*, or their hybrid. Photograph © The Trustees of the British Museum.*

some spiders and vertebrates (Merian et al., 1980–1982).[2] She had intended a longer sojourn in Surinam, but illness forced her to return to Amsterdam, where she worked for three more years to complete her most famous book, *Metamorphosis insectorum surinamensium* (Merian, 1705). Buyers could choose between an uncolored edition and one that was hand-colored by Merian, possibly assisted by her daughters (Reitsma, 2008). Merian was skillful in her use of color and usually worked from fresh rather than preserved specimens, so her images provide a very accurate depiction of the pigmentation of organisms (Merian et al., 1980–1982).

The 1705 edition of *Metamorphosis* contains 60 plates and accompanying text, and it was the first book to offer colored images of neotropical organisms. Each plate is set on a separate page, and the size of this 54 cm folio volume adds to the dramatic presentation of the organisms. Plates 56 and 59 depict both typical and atypical anuran reproduction in turn. Figures 2 and 3 (see also the cover) are photographed from original watercolors painted by Merian and therefore show the images as she intended them. The watercolors were acquired by Hans Sloane and are part of a complete set of the images from *Metamorphosis* now in the prints and drawings collection of the British Museum. It is not known if this particular series of paintings actually served as models for the engravers working on the plates for the book, because another complete set is housed at the Windsor Royal Library (collected by Richard Mead) and a third partial set is in St. Petersburg at the Russian Academy of Sciences (for a

[2] *In 1980 a limited edition facsimile volume of Merian's watercolors for* Metamorphosis *in the Royal Library at Windsor Castle was produced; this was followed in 1982 by a companion volume that included an English translation of Merian's text from* Metamorphosis*, identification of the plants and animals, commentary, an extensive biography, and English translation of several letters written to and from Merian (Merian et al., 1980–1982).*

discussion of this conundrum see Reitsma, 2008). Aside from being mirror images, the printed engravings are virtually identical to these original watercolors.[3]

Plate 56– ***Trachycephalus venulosus***

Merian pictured this tree frog in water, and indeed it would have been found in or near a breeding pond in the rainy season (Savage, 2002). The text accompanying each of Merian's plates is usually a straightforward description of her observations (translated from Merian, 1705):

> Many frogs swam in this water, with two ears on the head and a greenish-brownish cloud-like pattern. There was a little ball on each toe of the foot, which Nature has given these creatures in order to be able to move across these swampy waters. They lay their seed on the shore: if one wants to observe them, one should put some of the seed in a jar; one places a sod of grass in the bottom, the seed on this and then fills the jar up with water. The seeds are like little black speckles nestled in white slime. The undeveloped black speckles live off the slime and gradually begin to move. They develop tails and swim in the water after about eight days; five of them are shown here above the frog. They get eyes a few days later and they get hind legs a little later again. They get two front legs at the front, which burst through the skin, eight days later. When they have four legs, the tail rots and falls off and hence you have frogs that walk out of the water towards land. The water and grass sods need to be refreshed every now and then and breadcrumbs added to the water as soon as one observes movement. Everything was in agreement with Mr. Van Leeuwenhoek's previous observations (Leeuwenhoek, Fol. 113. a 126, Missive 25 September 1699).

It is interesting to note that she speculated incorrectly on the function of the toe pads, and it could be that she was not familiar with the European tree frog. She also confused the vocal sacs for "ears," she depicted the larvae without the external gills that should have been present in this species, and she did not understand that tail is reabsorbed during metamorphosis. It appears that she relied on her 1686 tadpole study (copy shown in Figure 1) to supply the image for the earliest stages of this frog, but she did show toe pads on the froglet being consumed by the Belostomatid water bug. The holotype for *T. venulosus* is from Seba's collection (Laurenti, 1768), but another early name for this animal was *Rana meriana* (Shaw, 1802) so that she was credited at some point for its 'discovery.'

Plate 59– *Pipa pipa*

Merian was the first European to record the image of *Pipa pipa* (Merian, 1705: Plate 59). A translation of the text that accompanied the plate reads,

> To finish off my work on insects, something that does not fit in well is an aquatic animal or toad. The female carries her young on her back; her uterus runs down along her back and she catches her seeds there and they develop. When they ripen, they work their way out of the skin; creeping out one after the other as from an egg. When I saw this, I threw the old one with her remaining young (some of which had their heads sticking out, others were half out) in alcohol. These toads are eaten by the blacks and apparently highly appreciated. They are blackish-brown in color with front legs like those of frogs but hind legs like those of ducks.

Naturalists viewing this image for the first time were undoubtedly astounded by the idea of an aquatic frog whose fertilized eggs develop and hatch from the dorsal integument. Merian related preserving the adult and her young in brandy, probably in order to have a specimen to observe more closely as she painted it. However, she must have observed one or more specimens over time to have been able to see and paint all of the stages, because she depicted the transformation from egg to free-swimming

[3] *I have examined both the Windsor library 'originals' and those at the British Museum, and these watercolors differ only slightly from each other and from the first edition copies of Metamorphosis colored by Merian. In some engravings animals are moved slightly closer to a plant, perhaps to fit constraints of copper plate printing, but the colors and details of drawing do not vary much.*

Fig. 2. Trachycephalus venulosus *with tadpoles and eggs (*circa *1704). Maria Sibylla Merian. Pen and ink with watercolor and bodycolor on vellum. The water hyacinth (*Eichhornia crassipes*) and the large predatory waterbug (nymph and adult,* Lethocerus sp.*) could occur in the same habitat. This image is the basis of Plate 56 in* Metamorphosis *(Merian 1705). Photograph © The Trustees of the British Museum.*

form within the single image. The *Pipa pipa* young are more accurately portrayed than those of *Trachycephalus venulosus*. The anomalous hermit crab and the lack of detail in the forefeet do not detract from the information conveyed by Merian's representation of this unusual form of amphibian reproduction. Merian's watercolors of *Pipa pipa* at Windsor and the British Museum also reveal something absent in the printed books, in that she tinted the eggs with gold to indicate more accurately their true color. The cost of doing this in the editions of *Metamorphosis* that were hand colored may have been prohibitive, so perhaps she sacrificed some color accuracy as a business decision. This species was named by Linnaeus (Linnaeus, 1758) based among others on the four images in Seba's Thesaurus (Seba, 1734, Plate 77).

Merian's contribution and influence

Merian was one of the first artist/naturalists to create an accurate and complete image of amphibian metamorphosis, both in her study journal and in the plates of *Metamorphosis*. Earlier images of tadpoles with frogs appeared in Guillaume Rondelet's *L'histoire entière des poissons* (Rondelet, 1558). However Rondelet's frogs looked similar to those of medieval bestiaries and the tadpoles are quite amorphous. Konrad Gesner's 1586 animal encyclopedia included a more accurate image of a mature frog that he termed *rana perfecta* as well as an incompletely metamorphosed froglet that he described as *foetus rana caudatus*, but no other stages were shown (Gesner, 1586). Oliger Jacobaeus was one of the first to illustrate the stages of amphibian metamorphosis from egg to adult, but his drawings were primitive and contained many anatomical errors (Jacobaeus,

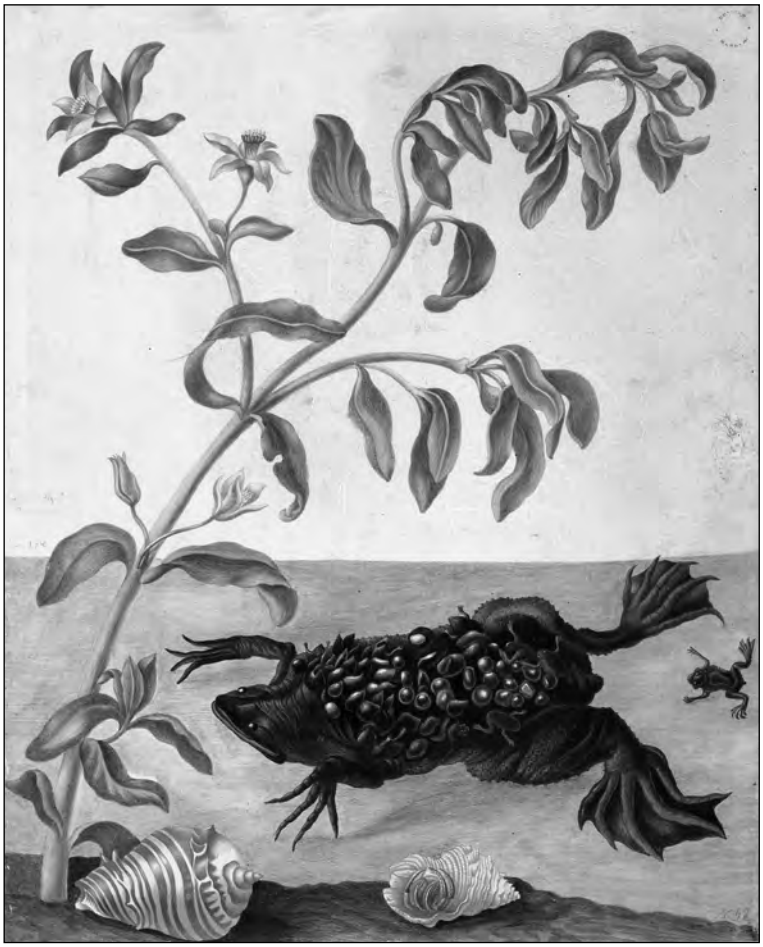

Fig. 3. Pipa pipa *female with young by Maria Sibylla Merian. Pen and ink with watercolor and bodycolor on vellum. The plant (*Sesuvium portulacastrum*), mollusk shells and crab are saltwater organisms, and probably were added for decorative effect. This image is the basis of Plate 59 in* Metamorphosis *(Merian 1705). See also the cover. Photograph © The Trustees of the British Museum.*

1686). Leeuwenhoek made a detailed drawing of a tadpole and described aspects of metamorphosis[4], but unlike Jacobaeus he did not depict multiple stages of development. Jan Swammerdam used a microscope to assist in making highly detailed drawings of eggs, larvae and adult frogs, but these images were not published until decades after his death, and well after Merian's 1705 *Metamorphosis* (Swammerdam, 1737–38). Merian's depictions of anuran larvae and adults were different from those of her predecessors in several ways. Notably, she provided color images, she portrayed the complete life cycle in one frame, and she showed the developing young from various angles. In her study journal, she also depicted both ventral and dorsal views of the developing froglet. Unlike many earlier images of anurans, Merian's images portrayed well-observed forms that did not rely on old archetypes (e.g. those showing frogs and tadpoles with a pronounced neck). Merian's images of tadpoles certainly were not as detailed as those by Leeuwenhoek or Swammerdam, and although she mentioned using a hand lens (Merian, 1705), it is not known if she had access to a microscope. Merian was aware of Leeuwenhoek's work, and like him, she understood that frogs did not arise by spontaneous generation, a common belief in the 17th century that persisted to some degree into the 18th century (McCartney, 1920).[5]

After Merian's death in 1717 her daughter Dorothea sold the engraved copper plates

[4] *Leeuwenhoek included this information in an unpublished letter to the Royal Society in London (1688, Missive 65).*

[5] *Unlike many of her contemporaries, she also understood that insects reproduced like other animals, writing that "all caterpillars, as long as the butterflies have mated beforehand, emerge from their eggs" (translated from preface of Merian, 1679, iv).*

for *Metamorphosis* to the publisher Joannes Oosterwijk, who added twelve additional plates to *Metamorphosis* in the 1719 edition (Reitsma, 2008). Most of the additional plates appear to have been engraved based on images by Merian, but at least two of the plates were not her work (Merian et al., 1980–1982). The additional plates remained in the subsequent 1726, 1730 and 1771 editions, which appeared in Latin, Dutch, German and French. One of the added plates, the 'frog-fish' (Merian, 1719, Plate 71), was an image taken from the first volume of Seba's *Thesaurus* (Seba, 1734, Plate 78). The frog depicted is the paradox frog, *Pseudis paradoxa*, which is known for a tadpole stage that is large relative to the adult frog. However, the Seba plate included a stage in which the tadpole becomes a fish, and this strange process is described in the text accompanying Plate 71 in the posthumous editions of *Metamorphosis*. The textual description was written in the first person by an unknown author, and referred to the 'drawing' as being a gift from Seba, thus giving the impression that Merian believed this to be an accurate representation of events. Because many more copies of the later editions of *Metamorphosis* were printed than of the original 60-plate volume, this fabricated sequence of transformations became associated with Merian and subsequently damaged her reputation for accurate observation. In 1759 George Edwards cited Merian in his address to the Royal Society on the "Frog-Fish of Surinam" and expressed skepticism about the image and text, stating that "Nature ... is not accustomed to act in such a manner" (Edwards, 1759). Later authors were more critical, and as one author wrote "the unusual transformations here recorded by the fair author have, of course, no foundation in fact" (Guilding, 1834, p. 375).

James Petiver corresponded several times with Merian about the possibility of publishing an English translation (Merian et al., 1980–82), but it appears they could not agree on the format or terms. Petiver later settled for using Merian's animal images in his *Historiam Naturalem Spectantia* (Petiver, 1767) in which animals were organized according to his notions of classification and removed from association with other plants and animals (Figure 4). Even though Maria Sybilla Merian brought two new species of frogs and dozens of species of plants and insects to the attention of European naturalists, her interest was not in naming or classifying, but as she wrote to Petiver[6], in "the formation, propagation, and metamorphosis of creatures, how one emerges from the other, the nature of their diet…" (Merian et al., 1980–1982). Perhaps for this reason she depicted both species of tropical frogs as swimming underwater, an innovative composition that emphasizes the importance of water in their reproduction. Merian also presented her subjects as part of a food chain, as in the view showing insect predation on the young tree frog. In unpublished watercolors of a European frog with tadpoles she showed the adult about to swallow an insect (see for example Figure 1).[7] Merian's work influenced many subsequent naturalists, including entomologists like Eleazar Albin, but also August Johann Rösel von Rosenhof and Mark Catesby, both of whom published illustrated books that included amphibians (Etheridge, 2007). In 1728 von Rosenhof was introduced to Merian's *Metamorphosis*, and was inspired to write the *Historia Naturalis Ranarum* on German anurans, which beautifully illustrates their reproductive cycle from mating through metamorphosis, as well as their external and internal anatomy (Rösel von Rosenhof, 1758). Rosenhof also included small images of frogs in their "habitat," and the frontispiece of *Historia Naturalis Ranarum* seems particularly influenced by Merian's imagery. Mark Catesby's two volume *Natural History of Carolina, Florida and the Bahama Islands* (Catesby,

[6] *Merian wrote to James Petiver on 27 April 1705 in response to specimens he sent to her (Sloane 4064, fol. 70, British library Department of Manuscripts).*

[7] *This scene was produced more than once by Merian, and I examined nearly identical watercolors of the frogs in the print collections at the British Museum and the Minneapolis Institute of Arts. Merian frequently reused images, so other copies may exist.*

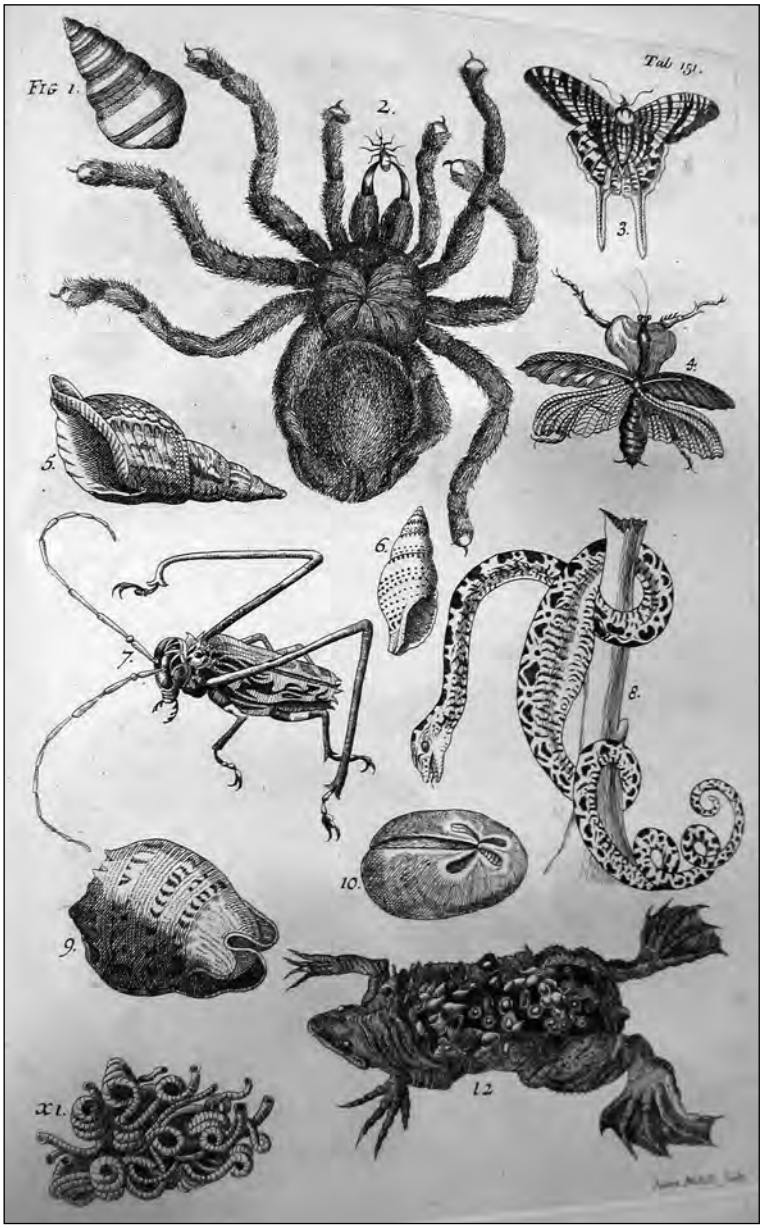

Fig. 4. *Images from* Metamorphosis *(Merian, 1705) reproduced in plate 151 of Petiver (1767). The* Pipa *is from Merian's plate 59, and the tree boa (probably* Corallus hortulanus*) is from Plate 5. Image courtesy of the Department of Library Services, American Museum of Natural History.*

1729) is similar to Merian's *Metamorphosis* in design, size and image composition, and it is well established that he was familiar with Merian's work (Meyers, 1997). Like Merian, Catesby detailed the diet and ecological relationships of many of the organisms that he observed, although he did not include any images of amphibian reproduction.

Some contemporary scholars view Merian primarily as a skilled artist, but she clearly saw herself as a naturalist. As was the case with many early naturalists she was not formally schooled, but she studied in the collection cabinets and libraries of Amsterdam, and she read and cited the work of Leeuwenhoek, Moffet, Swammerdam, Goedart and others. In the preface to *Metamorphosis* she wrote of her wish to paint and to describe her subjects from life, and stated that she "withdrew from society and devoted myself to these investigations" (Merian 1705). Merian's textual descriptions undoubtedly contributed to early modern natural history, but her larger influence came from her pioneering images. Unlike the illustrations of earlier natural history volumes, Merian's portrayals leave viewers with a sense of the animal as a living organism residing in a habitat, rather than as a specimen isolated on a page.

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